CLAIMS

1. A method of detecting the flatness of a band product running along a longitudinal direction and at high temperature, in which the band (2) is subject to tensile load and applied on the angular sector of a measuring roll (1) mounted to rotate round an axis perpendicular to the longitudinal running direction of the band (2) and having a cylindrical external face (13) comprising an angular contact sector with the band and a free sector,

characterised in that the roll (1) is cooled down forcibly by circulating a heat exchanging fluid along at least one portion of the free sector of the external face (13) of the roll (1) and one determines the parameters responsible for the cooling efficiency such as the opening (B) of the angular cooling sector along which the fluid circulates, the initial temperature of the said fluid and the circulation flow rate, so that, after heating up while passing through the sector (a, a') in contact with the band (2), the external face (13) of the roll (1) is brought back, after passing through the cooling sector (b, b') of the roll (1), to a pre-set equilibrium temperature.

2. A method according to claim 1, characterised in that forced cooling of the roll (1) is performed by spraying a heat exchanging fluid over at least one portion of the free sector of the roll (1) and one adjusts at least the temperature of the fluid and the spray flow rate in relation to the temperature of the band (2) and the thermal exchange conditions, in order to bring back to a set level the temperature of the external face (13) of the roll (1) immediately before it goes through the contact sector (a, a').

3. A method according to claim 1, characterised in that the flatness measuring roll (1) being located beneath the band (2), the external face (13) of the said roll comprises a lower section (b, b') immersed in a heat exchanging fluid bath (31) provided in a tub (3) situated beneath the roll (1) and associated with means for circulating the liquid with an adjustable flow rate between an inlet orifice and an outlet orifice of the tub (3), and one adjusts at least the initial temperature of the liquid as it reaches the bath and the circulation flow rate, in order to bring back to a set level the temperature of the external face (13) of the

roll (1) immediately before it goes through the contact sector (a, a').

4. A method according to one of the claims 1, 2, 3, characterised in that the external face (13) of the roll (1) is brought back, before it goes through the contact zone (a, a'), to an equilibrium temperature (t) that is linked with the temperature of the band (t_1) and the initial temperature (t_2) of the heat exchanging fluid by a formula such as:

$$t = \frac{a\sqrt{A}\,t_1 + b\sqrt{B}\,t2}{a\sqrt{A} + b\sqrt{B}}$$

in which (a) is the thermal exchange coefficient between the band (2) and the roll (1), (b) is the thermal exchange coefficient between the heat exchanging fluid (31) and the roll (1), (A) the angular contact sector (a, a') and (B) the angular cooling sector (b, b') and one can act, during operation, on at least one of the parameters of the said formula in order to maintain the equilibrium temperature (t) at a constant level.

5. A device for detecting the flatness of a band product (2) running along a longitudinal direction and subject to tensile load, comprising a measuring roll (1) mounted to rotate round an axis perpendicular to the longitudinal running direction and on which the band (2) is applied under tensile load, whereas the said roll (1) has a cylindrical external face (13) comprising an angular contact sector (a, a') with the band and a free sector,

characterised in that it comprises means (3, 34) for forced cooling of the external face (13) of the roll (1) by circulating a heat exchanging fluid along at least one portion (b, b') of the free sector of the roll (1) and means (30) for adjusting the cooling conditions in order to maintain the external face (13) of the roll (1) at a set temperature.

6. A detection device according to claim 5, characterised in that as the measuring roll (1) is placed beneath the band (2) and comprises an upper angular sector (a, a') in contact with the band (2) and free lower angular sector, the forced cooling means comprises a tub (3) filled with a heat exchanging liquid tub (31) in which is immersed at least one portion (b, b') of the free sector

of the roll and linked with a system for circulating the heat exchanging liquid comprising a means (30) for adjusting the temperature (t_2) and the circulation flow rate of the liquid (31) in relation to the temperature (t_1) of the roll (2).

7. A detection device according to claim 5, characterised in that the forced cooling means comprises at least one spray ramp (35) parallel to the external face (13) of the roll, linked with a system (36) for supplying a heat exchanging fluid and fitted with a plurality of spray nozzles (37), whereas each fluid jet covers a cooling angular sector (B), whereas the system (36) is associated with means (36') for adjusting the flow rate sprayed in relation to the temperature of the band (2).

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8. A detection device according to claim 7, characterised in that it comprises a cooling caisson (30) extending along the free sector of the roll and inside which is placed at least one fluid spray ramp (35), whereas the said caisson (30) exhibits two longitudinal walls (33, 34) parallel to the axis of the roll (1) and retracted at an angle to delineate a roll cooling sector (B), whereby each longitudinal wall (33, 34) has an edge (33', 34) parallel to the external face (13) of the roll and retracted from the said face by a small distance.

9. A detection device according to one of the claims 5 to 8, characterised in that it comprises a means (5) for fast retraction of the band (2) with respect to the roll (1).

10. A detection device according to claim 9, characterised in that the measuring roll (1) is mounted to rotate round its axis (10) on a supporting cradle (7, 16) moving along a direction transversal to the running plane of the band (2) between a position for applying the roll (1) on the said band and a retracted position, whereas the said cradle (7, 16) is associated with two deflectors (25, 25') (82, 82') placed respectively upstream and downstream the measuring roll (1) in the running direction of the band (2) and on the side opposite to the cradle with respect to the said band, so that the band (2) is applied on a set angular sector (A) of the roll (1), in the application position of the said roll.

11. A detection device according to claim 10, characterised in that the supporting cradle (7) of the roll is mounted to pivot round an axis (70) parallel to the axis of the roll (1) and associated with at least one jack (71) for controlling

the pivoting of the cradle (7) between an application position of the roll (1) on the band (2) and a retracted position.

12. A detection device according to claim 10, characterised in that the supporting cradle (16) of the roll is mounted to slide perpendicular to the running plane of the band (2), between an application position and a retracted position.

13. A detection device according to one of the claims 10 to 12, characterised in that the measuring roll (1) is placed between two pairs of pinch rolls, respectively upstream (8) and downstream (8'), each comprising a fixed roll (81) and a roll (82) mobile vertically for clamping the band 2 and in that both pairs of pinch rolls (8, 8') are associated respectively with individual rotational driving means that determine angular speed of the downstream rolls (8'), a speed which is slightly greater than the angular speed of the upstream rolls (8), in order to subject the band (2) to a set application tension on the measuring roll (1).

14. A detection device according to claim 13, characterised in that the rotational speeds and the torques applied on both pairs of pinch rolls, respectively upstream (8) and downstream (8'), are adjusted in relation to the rolling speed in order to determine separately the tension levels of the band (2), respectively, at the outlet of the roll mill (6), on the measuring roll (1) and on the coiler (21).

15. A detection device according to one of the claims 5 to 14, characterised in that the measuring roll is of the type comprising a plurality of detection zones retracted in the direction transversal to the band and distributed over the whole length of the roll, whereas each detection zone comprises a sensor transmitting a signal depending on the application pressure of a corresponding zone of the band as the band passes through the angular contact sector, and in that the said detection zones are brought back to the same equilibrium temperature, at each passage through the free sector of the roll.